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ABSTRACT

Focusing on techniques for teaching students to integrate diverse ideas at a deep level of cognitive processing, a study evaluated an idea integration package for teaching writing in the college classroom. Subjects, 29 college students from an introductory psychology class at a Utah university, were divided into two groups. The integration group was given practice in the following techniques central to the idea integration package: (1) generating semantic overlap between three mind maps; (2) using visual imagery to incorporate five words in a cluster into a single visual image, along with imagery memory training; (3) producing analogies between pairs of ideas to produce real choices concerning how ideas might be integrated; and (4) using a "sprint" writing technique and then examining the writing for the integration and organization that has emerged. The control group was given practice in organizing papers and paragraphs. All subjects then completed a criterion integration task. Results indicated higher integration ratings for the integration group than for the control group. These findings showed that, even though the idea integration package did not include anything specifically targeting text generation, teaching the techniques to students affected their writing enough to influence judges' rating of integration in the text. In linguistic terms, these results suggest that affecting the deep structure of a writer's organization will affect the surface structure of the written product. (References are included. Test materials and sample data are appended.) (JD)

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CS 210 391

Teaching Integrative Thought: Techniques and Data

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Abstract

An Idea Integration package for teaching writing in the college classroom is described. The package includes techniques for teaching students to integrate diverse ideas at a deep level of processing that forms a foundation for surface organization. Free association is used to create a mass of chaotic information that is prerequisite to the emergence of new order. The process of associative clustering is used to coalesce this chaos into relatively large chunks of meaning. These chunks are then woven together into an integrated whole by the associative processes of semantic overlap, visual imagery, analogic isomorphisms, and emergent organization. Data, collected in both research and classroom settings, are reported showing the effectiveness of the Idea Integration package in producing higher ratings of integration in written text.

Teaching Integrative Thought:

Techniques and Data

A gift of Copernicus, we have an image of the solar system: A fiery center surrounded by planets, moons, comets, asteroids and various bits of debris moving in an elegant, elliptical dance, bound into a single whole by immense cohesive forces in equilibrium. Even though we know of the existence of cohesive forces like gravity and momentum in many ways--for example, we can feel them--their essential nature remains a mystery.

How did this orderly dance come to be? One theory is that a nebulous cloud composed of an uncountable number of particles once drifted though space, twisting and seething in gigantic currents. There were two pertinent characteristics of this nebulous cloud. First, the particles had little or no order; that is, they were in a state of high entropy or chaos. Second, the particles did not drift calmly in a state of balance; rather they were in nonequilibrium, moving energetically in boiling currents. Those were the preconditions for new order. Then particles clustered into great chunks of matter, principally the sun and planets. Finally, the cohesive forces of gravity and momentum bound these chunks together in a balanced dance. The harmonies that evoked this dance are not well understood.

Traditional physics has regarded entropy as steadily increasing to a chaotic maximum, resulting in a dead universe. But Nobel laureate Prigogine collaborating with Stegners (Order out of Chaos) proposes that the source of new order is chaos in nonequilibrium. In this revolutionary

view, the forces of entropy are not winding the universe down; rather, they are crucial triggers for the evolution of new, more complex orders. Thus the formation of a solar system from a nebulous cloud is no oddity, it is the generative rule.

This description of the solar system will act as a working example illustrating techniques for teaching students cognitive processes that allow them to fuse diverse ideas into orderly wholes. Since writing is an act of communication, this integration of ideas can be conceived of as taking place in the writer's mind, in the reader's mind, or in the text between them. I will emphasize integrating ideas in the writer's mind and presume that teachers will help students make the connections to text and audience.

For good writers the cognitive processes which yield this profound integration of several ideas into a whole are often so practiced and automatic as to be inaccessible to consciousness. The spontaneity and unconsciousness of it makes the elaboration of the steps of the process difficult to discover from a writer. Fortunately Dilts, Grinder, Bandler, and DeLozier (NLP) have laid out explicit procedures for discovering such unconscious processes. Using their techniques, I interviewed a number of writers. These interviews yielded four different processes for generating integrated ideas. These were then developed into classroom procedures for teaching students idea integration processes. After making adjustments based on classroom use, the procedures were condensed into brief packages that could be quickly taught to groups of subjects for experimental evaluation. The results of these evaluations are reported at the end of this paper.

An even more condensed version of the packages will be presented here. Both in teaching students in the classroom and in teaching subjects in the experiment reported here, I have assigned students an arbitrarily difficult task of integrating three unrelated ideas, such as "gravity," "hardship," and "charm." Usually there is some natural relationship among the ideas we write about. But, as a teaching device, I wanted a difficult task that would challange students' integrative abilities.

Preliminary Considerations

Before describing the techniques themselves, I will address two issues that frequently arise when I teach idea integration: Developing the meaning of idea integration for students through reference experiences; and creating an open mind-set for students by reframing the experience of confusion. These issues are not directly involved in idea integration; but dealing with them is useful in setting up an atmosphere conducive to integrative thought.

Reference Experiences. The abstract vagueness of the words "idea integration" will presumably evoke some meaning in every student, but what that might be is hard to guess. Communicating an abstraction is a general classroom difficulty, for which one antidote is a "reference experience." This is a strong and clear classroom experience which defines an abstraction. For example, a simple case of a reference experience is completing the sentence that begins with "For example..." The students can then refer to these "reference experiences" whenever they think of the abstraction.

Reference Experiences for Idea Integration. In essence, idea

integration has similarities with what psychologists have called a Gestalt--an organized entity or whole exhibiting properties that are not perceivable in its parts taken individually. A melody cannot be heard one note at a time; rather it is the various relationships that integrate the notes into a whole which allow the emergence of that characteristic we call melody. Figure 1 provides several visual reference experiences in which shape emerges from parts, none of which account for it.

Figure 1a, which shows a sprinter crouched at the block, illustrates how a whole can transcend the meaning of its constituent elements.

Insert Figure 1 about here

Figures 1b through 1e are random shapes generated by random processes for research on perceptual learning (Vanderplas and Garvin, "Association"); thus, in reality they are nothing, or, at least (or should it be at most?), chaos. The purpose of making random shapes is to research the perception of objects that have no meaning. But, humans cannot resist imposing organization, even on chaos, thus foiling the purpose of the researcher. For example, people often see Figure 1b as an anteater and Figure 1d as a monk carrying a candlestick. Readers may impose their own order on Figures 1c and 1e. Perhaps the most important reference experience for students is the "aha" that comes at the moment a chaotic inkblob turns into an anteater or when a bunch of blobs turn in to a sprinter--integration into a whole. Organization is not something foreign and difficult; it is an irresistable force felt by everyone; indeed, it is extremely difficult to have an experience without meaning. Within us are

forces as irresistable as those that draw the dust particles of a nebulous cloud into the coherent order of our solar system. Consequently, creating organized wholes is not something alien that needs to be learned; it is an urge within all humans. Beginning writers need to experience this urge and then to bring it to their writing processes.

Once we do see the anteater or sprinter it is difficult to see the blob in any other way. The nebulous cloud might have become any well organized system; but now that it is our solar system, it would take immense physical forces to rearrange it into a different system. It is next to impossible to look at Figure 1a and see only the chaotic globs we saw just before we organized them into a sprinter. We may not understand the cohesive "forces" by which our minds hold the anteater order on the chaos of a particular random shape any better than physicists understand the mysterious gravitational forces that hold the solar system together, but we can feel them, and use them.

A strong order can tolerate deviations. The anteater is not every detail an anteater; people tolerate, even delight in, exceptions to strong organization. A final point can be made to students from the random shapes: Writing should not be approached like a Rorschach inblot test. While it is true that the reader has an irresistable urge to create order, that does not mean the writer need not offer any. The reader's "aha" experience should be provided by the writer, usually early in the paper, although, when writing for certain purposes, such as suspense, it may come later.

Figure 1f shows a mandala in which a rotor blade, three lilies, perhaps birds or bird wings, and other elements are woven into a single

energetic entity. The parts in this case are not discrete pieces but rather flow across each other to form a whole, as will often happen in writing. In a similar way, the description of the solar system that opened this paper is useful as a reference experience for the balanced interaction of separate chunks of matter to form a whole.

Students also need reference experiences for integration in writing. Whitehead ("Organization") addressed this issue in his essay on the integration of thought:

> Organisation is the adjustment of diverse elements so that their mutual relations may exhibit some predetermined quality. An epic poem is a triumph of organisation, that is to say, it is a triumph in the unlikely event of its being a good epic poem. It is the successful organisation of multitudinous sounds of words, associations of words, pictorial memories of diverse events and feelings ordinarily occurring in life, combined with a special narrative of great events: the whole so disposed as to excite emotions...(p. 153)

For students who may not have a reference experience with an epic poem, Whitehead's example may be inappropriate. Shah (Nasrudin) tells a story of the wise fool, Nasrudin, who one day went into a shop that stocked all manner of things. Nasrudin asked in turn if the shopkeeper had nails, leather, twine, and dye and if each of these were of adequate quality, to which the answer in every case was yes. Then why don't you make a pair of boots? Nasrudin asked. And why don't students write organized papers? They may have fine enough ideas, solid enough library research, readable enough sentences, coherent paragraphs, even a beginning, middle and end, yet somehow they often fail to sew all these elements together into a complete whole. Shaw's (Nasrudin) book is full of short, integrative tales that students find interesting reading. Thomas (Medusa) is another source of short pieces that integrate diverse ideas. Thomas' book even

contains an essay ("On thinking about thinking") that paints a picture of the mind as containing dense clouds of "notions" that aggregate into ideas by action of forces much like gravity to be arranged in some sort of elegant dance. I recommend that teachers find written materials that will give students reference experiences of deep organizations in which a a whole emerges from its parts.

Reframing Confusion. Moffet ("Liberating") has pointed out that humans become obsessed by highly-structured, vicious circles of thought cycling within thought so that we cannot surprise ourselves with new ideas. In terms of the solar system analogy, what are needed are forces which throw these old orders out of equilibruim and increase entropy. Fortunately there are such "agents of entropy" (Grinder and DeLozier, Genius) such as the mind-wanderings of free association, and they are often indicated, as Bandler (Brain) argues, by confusion. Bandler points out that "confusion" and "not understanding" are very different. There are many things, such as brain surgery, that you have little information about and do not understand. In contrast, confusion occurs when you have lots of information that is not yet organized in an understandable way. Confusion is an excellent indicator that disorder and entropy are increasing and that some old way of understanding is disintegrating. The solar system analogy can be used to engage students in considering the possibility that disorder might be a precondition for the jump to a new order, and that confusion might be a signpost for anyone seeking new organization. Students need to be assured, even convinced, that, paradoxically, confusion can be an important experience in organizational processes. In my teaching experience, too often they turn away from a

task at the first sign of confusion, rather than seeing confusion as signalling that nebuluous cloud, rich with information, upon which their orgnaizational powers can operate.

Idea Generation

One reason students have difficulty integrating ideas is that their concepts often have limited scope and impermeable boundaries. In this section I will present techniques for expanding conceptual boundaries and generating new ideas. In terms of the solar system image, these techniques allow students first to generate a nebulous cloud of ideas and then to coalesce that cloud into planet sized chunks.

Free Association: Creating Chaos. The mass of this information will come from many sources, including reading, general knowledge and standard library research. Assuming such sources have been tapped, I will turn to a process for generating information in a particularly disorganized form. Free association is one naturally occurring force which generates sufficient disorder to allow reorganization of ideas. While free association is simple, it is worthwhile to give students a clear reference experience for it. I tell them to write down the first five words or thoughts that come to mind to a word that I will write on the board; then I write down a word such as "black." Black is particularly instructive because generally about half the class will write "white" as the first associate (man-womam, doctor-nurse are other highly related pairs). I then solicit several first and several fifth associates from the class and write them on the board. Invariably, there is substantial overlap in the first associates and next to no overlap in the fifth associates. This

reference experience demonstrates that a first response to an idea is often culturally determined, but that free association allows us to slide through the networks of our own knowledge to unique, and often unconscious, responses. Rather than fighting with the "drunken monkey," free association takes advantage of the fact that people's minds wander. In fact, given loose enough reins this force will draw people to the confusion beyond the confines of vicious circles.

After students had thoroughly digested the simple skill of recording the uncensored wanderings of their minds, they were trained in a technique standard in problem solving as well as teaching writing, referred to here as mind mapping, but called brainstorming by others. They were instructed to write a focus idea, e.g., gravity, in the center of a piece of paper and then to jot down chains of ideas that were associated with it. Whenever their chain of thoughts wandered "too far" (writers can set their own criteria, but I suggest at least five associations), they returned to the focus idea to begin a new chain of associations, so that the paper, at least initially, looked like a wheel with the focus idea as hub and spokes of chained associates radiating outward in all directions. However, some of the associates themselves might be intriguing enough to trigger their own chains of associations so that the paper ended up looking like a chaotic web. Even this is too much structure; sloppiness in such a project is essential. Doodles, arrows from one entry to another, and other messy devices were encouraged. The emphasis was on working quickly without censoring or evaluating. To get past the level of trivial associations, students were required to jot down haphazardly on the paper a minimum of fifty associates to the focus idea. Lists and outlines were

discouraged. Indeed, students were encouraged to expand their mind maps until they felt confused by all the unrelated information. They generated three such mind maps, one each for three different ideas they were to integrate, e.g., gravity, hardship, and charm (e.g., see Figures 2 and 3 in Appendix). At this point, having created somewhat of a nebulous cloud of associations around each of these three ideas, I taught students to cluster these associations into larger chunks.

Associative Clustering. A well known phenomenon, first reported by Bousfield ("Clustering"), is that when humans respond in unstructured situations such as free recall or free association they do not emit responses randomly but rather in related clusters. The responses within each of these clusters, or chunks--to use Miller's ("Magical Number") broader and more commonly used term--are associated with one another in a way that reflects the unique associative structure of each person. For a chunking reference experience see Appendix. Students were told that the entries on their mind maps would cluster into chunks, and that they should find these chunks. For example, one student clustered her "gravity" mind map into several entries about falling objects (including the cultural cliche of an apple falling on Newton's head), several entries about serious matters (including poverty during the Great Depression), several entries about attraction (including interpersonal charm), and several entries about dancing and movement (including the central theme from the movie Turning Point). Students were asked to give each chunk a name (so they could remember and refer to it easily); for the example above, "falling," "seriousness," "attraction," and "body movement" would do. The purpose of this part of training was to take advantage of the natural

associative forces of the mind to coalesce planet sized chunks out of the nebulous cloud of associations created by free association. Associative clustering is an easy and natural way for students to discover their own, personal, naturally occurring organization underlying each of the three mind maps.

Idea Integration Techniques

Up to this point I have set the stage for idea integration. Students have been given reference experiences for idea integration. They have been given a set which allows them to tolerate confusion and uncertainty accompanying the gathering and generating of large amounts of information. They have been taught to free associate to generate enough unstructured material to allow the emergence of new and original organizations. They have also been taught to cluster this unstructured material into large conceptual chunks. Now I will turn to idea integration proper. I will present four techniques for generating the cohesive forces that bind "planetary" chunks into an integrated whole like the solar system. These four techniques represent a menu of choices; they may or may not all be appropriate for a particular writing project. Which one will be used will depend on the person who is writing as well the writing context.

Semantic Overlap. In this idea integration technique, students were taught to look for and to generate semantic overlap between the three mind maps. For example, for the student mentioned above, one of many lines of association to "gravity" was "seriousness, no money, stock market crash, factory worker, cold, hunger..." A line of association to "charm" was

"nostalgia, home-made butter, grey-haired grandma, father selling vegetables door to door..." A line to "hardship" was "early marriage, no money, no work, depression, Democrats, politics..." She was easily able to find pleasant evenings listening to her father tell stories of selling vegetables door to door during the depression as a place where, in her personal knowledge system, the meanings of gravity, hardship, and charm overlapped (see Appendix Figures 2 and 3, for example). Clearly, this integration of ideas was personal and unique, unlike that of any other student. Another, more technically-oriented, student discovered an overlap in the meanings of charm and gravity as forces of attraction in physics, "charm" at the subatomic level, "gravity" at the macro level.

If no overlap was immediately apparent, students were asked to look at their mind maps for the most likely locations for overlap, and then to use free association to create an overlap between the concepts. Occasionally, students were not able to discover or create an overlap between all three focus concepts; they were told that this was fine, that no technique worked for every case. This was emphasized to ensure that the students thought of any limitations as resulting from the technique rather than from themselves.

Visual imagery. Imagery has enormous potential for cementing ideas together. The ideas do not have to go together semantically or logically for imagery to cement them. Consider, for example, an image I saw on television during late summer, 1984. The picture I recall is of Ronald Reagan hugging a grey-haired old lady in front of a sparkling new housing project for old people, with balloons rising and music playing. Next, Tip O'Neil, standing against a grey background, appeared and began talking;

and my mind wandered. I'm sure Tip was pointing out that Ronald Reagan had vetoed the monies for this particular housing project and that the Democrats had over-ridden his veto. But it is the image of Reagan and the grey-haired old lady smiling, that I clearly remember. I'm sure many other voters did also. Perhaps this was an example of cementing together "hardship" and "charm." Perhaps for some the issue is grave enough to include "gravity."

Ever since Cicero (Norman, Attention), visual imagery has been used as a powerful rhetorical and mnemonic device. To acquaint students with this tradition they were given a series of visual imagery reference experiences based on work of Bower ("Imagery")--see Appendix for details. Following Bower's procedures, they were first asked to memorize a list of twenty-five words using repetition instructions and then another twenty-five words using an imagery mnemonic. Each list was read aloud in five clusters of five words each. At the end of each list, the first word in each cluster was read aloud and students were asked to write down the four words that went with it. Repetition instructions asked students to repeat the clusters of words over and over in their inner voices until the next cluster was read aloud (about five seconds). Imagery instructions asked students to make an image that incorporated all the five words of a cluster into a single visual image. For example, if the five words in a cluster were "ice, tennis-racket, soup, lake, and truck," you can imagine a tanker truck that has a tennis-racket as a hood ornament driving across a frozen lake spewing chicken soup from its tank and thawing the ice.

The memory task was difficult; most students scored between three and seven correct responses out of twenty under repetition instructions. In

contrast, when they used imagery instructions, they generally scored between fourteen to eighteen correct responses. The purpose of the imagery memory training was to provide a strong reference experience for the students of the power of imagery to integrate ideas, even if the integration is arbitrary or even bizarre. Since the memory task was fast paced, subjects did not have time to think of clever images to associate the five words in each cluster. But, any image, however silly or haphazard, will affect how well the various ideas in a cluster are associated and therefore later remembered. Based on this reference experience, students learned that visual images are powerful cohesive forces that can hold ideas together, irrespective of logic, as in the Reagan example.

Of course, in quality writing the images will be more thoughtful than those generated in a few seconds in a memory experiment. For example, technical writing often uses carefully considered graphs and diagrams to relate and bring together various ideas. In fact, the solar system was once used as an image to understand the complex ideas within atoms, but that image is no longer considered useful. A unifying image may be poetic and symbolic, such as Melville's white whale. While any image that incorporates two or more ideas has the potential to integrate them in a person's mind, finding an image with power and depth often requires escaping from the old order, from the closed system of ideas that first comes to us. In this regard, using the free association technique to discover images allows the oportunity for interesting, unconscious images to surface.

After training in the imagery mnemonic the students were instructed to

use imagery to integrate the three focus concepts (e.g., gravity, hardship, charm). They were told to look over their mind maps for good, integrative images, or to use the free association technique to form at least three images incorporating all three of the focus concepts.

Analogic Integration. The third idea integration technique, Analogic Integration, was adapted from the work of Gordon (Metaphors). The students first practiced generating analogies of the general form, X is like Y because Z. For example, love (X) is like a bath (Y) because different people like different mixtures of hot and cold to be comfortable (Z). The analogy could be changed by substituting other Z's, such as, love is like a bath because some people fall and get hurt. Lakoff and Johnson (Metaphors) offer a rich resource for constructing exercises for students (see p. 49 for metaphors about love). If both concepts are abstract, such as "gravity " and "hardship," analogies may be difficult for some college freshmen to invent. In such cases, it helps to have students think of a concrete example of whichever concept is in the Y position. Students might change "gravity is like hardship," which is rather difficult, to "gravity is like an empty stomach," which is easier (e.g., "gravity is like an empty stomach because they'll both break an egg"). Of course, sometimes the abstractions fall together easily (e.g., "Gravity is like charm because they are both forces of attraction.").

Students practiced generating analogies until the process seemed easy to them. Then they were asked to generate enough analogies between pairs of ideas (e.g., between gravity and charm) to produce a real choice in approaching the way the ideas might be integrated. For example, "Love is like an automobile because there are lots of sleazy used-car dealers out

there," leads to a rather different approach to writing about love than does "Love is like an automobile because (to borrow from Pirsig's Zen) they both require peace of mind to run smoothly."

In the next phase of the Analogic Integration technique students created isomorphisms (one-to-one correspondences) between aspects of the X and Y concepts as shown in Table 1. The purpose of the these isomorphisms was to expand the simple idea of an analogy into a web of interrelationships that could be used to integrate the two concepts in many ways in students' minds. A good analogy often yields only one sentence or paragraph if the writer does not know how to develop it. Creating simple isomorphisms between the parts of the analogy is a easy technique which expands the analogy and

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Insert Table 1 about here

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gives it depth in the writer's mind. It should be clear that that the analogic integration as described here is not a fully developed package for creating the structure of metaphors to be used in writing. It misses several important steps suggested by Gordon (Metaphors) if it were to be used as a way of teaching students to create metaphors. While it does include some important parts of structuring a metaphor, its purpose here stops at creating links that tie two ideas together. Analogic Integration is a way of thinking that allows unrelated concepts to be stitched together by analogy and isomorphism to form a boot, as it were.

As with the imagery technique, it is important in the analogic integration technique to get past limiting first thoughts. Free

association is useful in allowing unconscious analogies and isomorphisms to surface.

Emergent organization technique. The Fourth and final integration technique was emergent organization. This fourth technique simply required subjects to write and then to search for the integration and organization that emerged from their writing. The students were taught a "sprint" writing technique, that is, they were told to write quickly and continuously on their topic for five minutes without pausing or raising their pens from the paper. If they could think of nothing to write they were instructed to repeat the previous word over and over until they were able to think a new thought. They were urged to avoid censoring at any level including the evaluation of ideas, sentences, punctuation, grammar. After they had produced text, they were told to read it carefully and to discover any organization and integration of ideas that they had generated while sprinting. They were also instructed that at any point in the writing process, new perceptions of organization might appear, and that they should take advantage of these.

This completes the Idea Integration package. The opening description of the solar system is offered as an example of a combination of visual imagery and analogic isomorphisms integrating the diverse concepts considered here. It is also offered as a teaching device that ties together free association (generating an unstructured cloud of ideas) and associative clustering (getting planet sized chunks) with idea integration (various forces that can bind the planets together into a whole system). It is also useful in teaching students not only to accept but to use the confusion and chaos that often accompany the early stages of a large (or

even small) writing project. The solar system image is not meant to imply a rigid correspondence between mind and physics; rather it is meant as an easy-to-remember guide through a rather complex series of cognitive processes for integrating ideas.

My emphasis in the above presentation has been on the broad brushstrokes of several organizational processes. In the classroom these processes must be married to text generation. For example, as part of practicing summaries and abstracts, I have students read three articles on three rather different topics. Once students have abstracted the essential idea from each of these articles, I have them practice writing a paper which integrates the main ideas from each article, using the Idea Integration package. Such an assignment simulates many of the features of professional writing in which diverse ideas from various sources are fused together. I also have students rewrite this integrative paper, again using the Idea Integration package to alter their first draft. This is to emphasize that integrative processes are not (exclusively) prewriting but interact with the text at all stages of writing. An integrative image may occur after most of the text is written. At any point in writing when integration is necessary, any one of these processes will be powerful. In this sense, while I have presented and do teach these processes in a ordered and coherent fashion, they are semi-autonous, more like a menu of options than a rigid structure. From the point of view of cognitive theories of writing (e.g., Flower, Hays, Carey, Shriver, and Stratman, "Detection," p. 22), the Idea Integration package describes the teaching of processes that generally fit into boxes that say "Organizing."

Experiment

Subjects were taught these techniques in an experiment to evaluate their effectiveness. Clearly, in a writing class, there are many more processes that would be taught to foster organized papers; but these techniques generate a fundamental and important level of thought integration that forms a foundation on which to build coherent, organized surface structures. Thus, these techniques were taught in isolation in the experiment because I wanted to evaluate them *per se*.

Method

Design. Two groups each participated in a three-hour and then a two-hour session two days apart. The Integration Group was given practice in the Idea Integration package for integrating unrelated ideas. The purpose of the Integration Group was to evaluate the effectiveness of these cognitive techniques for integrating ideas. The Control Group was given practice in organizing papers and paragraphs. The purpose of the Control Group was to control for positive set and demand by giving subjects experience in thinking about organization in writing.

The dependent variable was the average of three blind judges' ratings of the quality of integration in writing done by subjects on the criterion task.

Subjects. Subjects were recruited from an introductory psychology pool and received class credit for participation. Subjects signed up and were run in groups, fifteen in the Integration Group, fourteen in the Control Group. Running subjects in groups this size simulated classroom conditions.

Integration group procedure. During the first session, subjects were

trained in the Idea Integration package. This included reference experiences for idea integration, mind mapping, associative clustering, semantic overlap, visual imagery, analogic isomorphisms and emergent organization. During the second session, subjects practiced them on a task that required the integration three of practice ideas: Jet, polka, sneakers. They were led through each technique while trying to integrate these ideas. Then they participated in a group discussion of the experiences they had using each technique. This allowed them to ask questions and refine their use of the techniques. It also allowed the experimenter to determine if everyone understood and could use the various techniques. During the practice task, the subjects wrote only during the sprint; they did not write a paper integrating the three practice ideas.

Control group procedure. During the first session, the Control group was trained in standard organization and integration for writing, relying on photocopied handouts from writing textbooks. The subjects were given reading and practice in taking a group of phrases that simulated notes on a topic and organizing them into coherent topics. They were given reading and practice on the topic of unity in papers and paragraphs. This included practice with topic sentences. Finally they were given reading and group discussions in producing coherence in papers and paragraphs including consistency and various types of transitions.

During the second session, control subjects were asked to integrate three focus ideas: Jet, polka, sneakers. They were led through each of the types of organization and integration topics they had learned during the first session and then participated in group discussions of how they would write a coherent paper integrating these topics. They never

actually wrote the paper.

Criterion task. The criterion task, which was designed to challenge the integrative abilities of subjects, required them to integrate three unrelated, abstract ideas. Subjects were given the following scenario. They had entered a writing contest sponsored by student government. First prize was a weekend for two in any city in the west. Their work would be judged by undergraduate student representatives who would evaluate the quality of their work, concentrating on how well they integrated the ideas involved. They were told they should try to inform or entertain their audience. The task was to write (in one hour) a paper that integrated the three ideas: Gravity, Hardship, Charm (or on an alternate form, Distinction, Mischief, Unification). They could write whatever notes and drafts they wished on supplied paper, but their final draft and only their final draft must be written in a blue book. It should be noted that the three judges were, in fact, undergraduates who did rate the writing protocols primarily on integration.

Results and Discussion

Dependent Variable. All writing protocols were judged by three independent, blind judges on a seven point integration scale. The integration rating scale ranged from one to seven with one indicating no integration and not all three focus ideas present, two--no integration but all three focus ideas present, three--one pairwise integration and all three ideas present, four--two pairwise integrations and all ideas present, five--three pairwise integrations, six--loose three way integration, and seven--tight three way integration giving a gestalt incorporating all three ideas.

Training of Judges. Judges were trained by judging data from a pilot study. Initially, the judges met and discussed the scale with the experimenter. They then used the scale to judge pilot writing protocols generated by the criterion task. The judges and experimenter then met and discussed all discrepancies in ratings. At this time the scale was modified and the definitions of the seven points were sharpened based on the judges' suggestions. The judges once again rated different pilot protocols and subsequently discussed discrepancies in ratings. Reliabilities were calculated and found to be too low. So the judges once again judged different pilot protocols and discussed the scale. Reliabilities were calculated and deemed satisfactory. At this time judges were given the experimental data to judge.

Reliability. Reliabilities of these ratings were estimated using the intraclass correlation for the average of the ratings for the three judges. The intraclass correlation for the average score of the three judges was .7655. The average ratings were used in comparisons of the experimental and control groups.

Criterion Data. The mean rating for the integration group was 4.78 with a standard deviation of 1.14. The mean rating for the control group was 3.53, standard deviation = 1.07. A t-test comparing the two means showed a significant difference between them: $t(27) = 2.93$, $p < .005$, one-tailed. This indicates higher idea integration ratings for the integration group than the control group. Even though the Idea Integration package did not include anything specifically targeting text generation *per se*, teaching it to subjects impacted their writing enough to affect judges' ratings of integration in the text. In linguistic

terms, affecting the deep structure of a writer's organization will affect the surface structure. Even so, an obvious caveat is that in actual classroom use these integrative techniques need to be practiced in the context of text generation.

I also ran a pre-post quasi-experiment with no control group in one of my writing classes. Students were pre-tested on one form of the criterion task, then taught the Idea Integration package, and finally post-tested. Some students had one form of the criterion task as a pre-test, while others had the other form as pre-test, and visa-versa for post-test. A different set of judges from those used in the above experiment were used. The post-test was given right after I taught the Integration Package and before I taught more text oriented aspects of organization because I wanted to measure the effect of the package rather than other interventions. The mean integration score for the pre-test was 2.24, standard deviation = 1.24, and the mean for the post-test was 3.76, standard deviation = 1.19. The difference between the pre-test and post-test ratings was significant, $t = 3.71$, $df = 13$, $p < .005$, one tailed. This is not a true experiment with proper controls nor was it meant to be, since that was already accomplished in the experiment reported above. I simply wanted to verify the effects of the package in my classroom.

The starting point of the Idea Integration process is the creation of a confusing and nebulous cloud of information from whatever sources are available. Free Association is especially effective in quickly generating chaotic information in the form of a mind map. Ideally, the mind map is packed with information and rich with seeming irrelevancy, including many

lines of thought that may not be used. This chaotic information is coalesced into "planet" sized chunks based on the natural process of Associative Clustering. Then the associative forces of Semantic Overlap, Visual Imagery, Analogic Integration, and Emergent Organization draw some of these chunks together into a balanced system of ideas that cohers as a Gestalt.

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Table 1

An example of developing the analogy "Love is like a bath because it takes just the right temperature to be comfortable," by creating isomorphic links between aspects of "love" and aspects of "bath."

Aspects of love	Aspects of baths
Degree of intimacy	Temperature of water
Control in relationships	Hot and cold valves
Passion and intimacy	Hot water
Distance and privacy	Cold water
Need for good relationships	Need to have a bath
etc	etc.

Figure Captions

Figure 1. Visual stimuli for organizational reference experiences.

Figure 1. Visual stimuli for organizational reference experiences.

APPENDIX

Idea Integration

Malloy CCCC87 Idea Integration

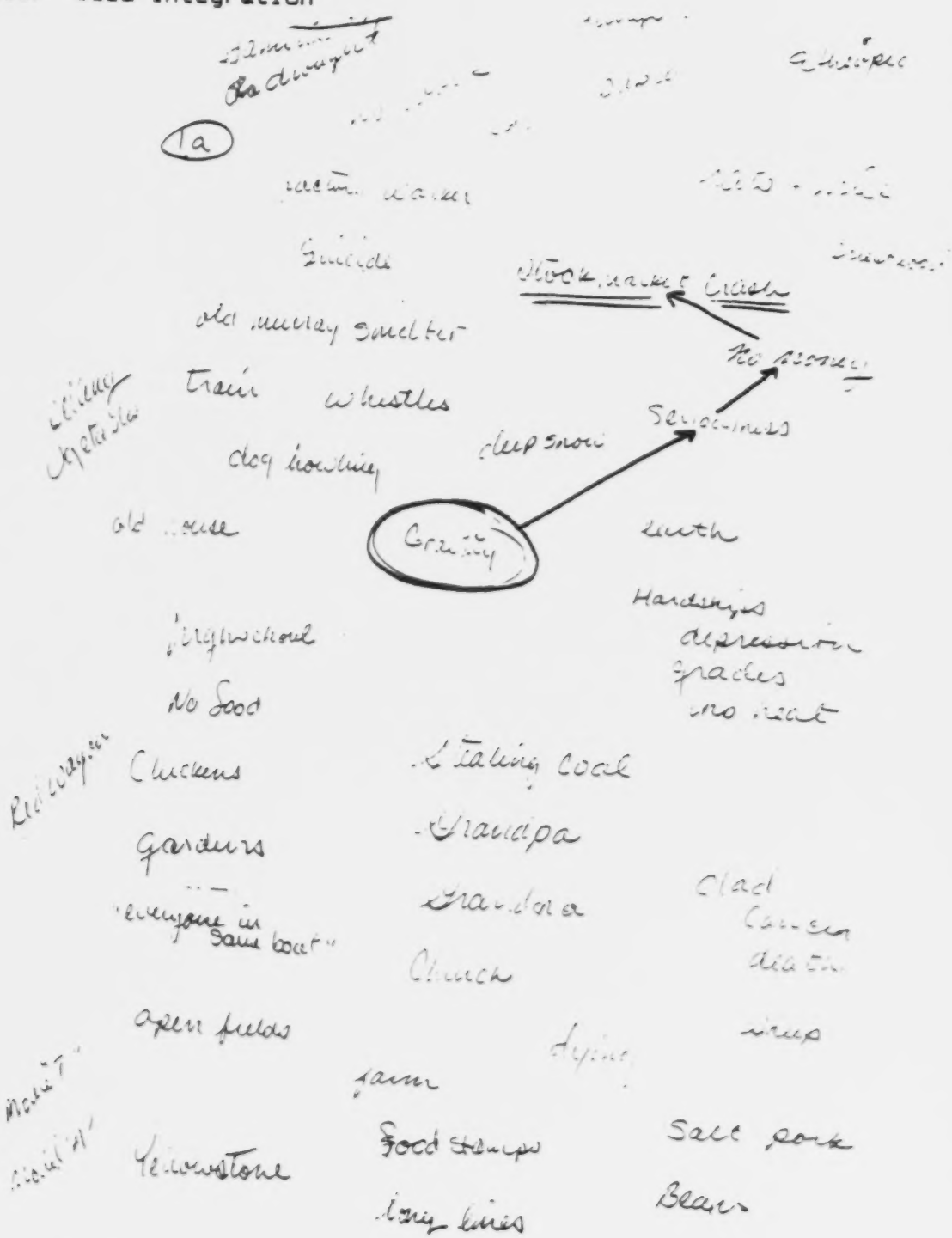

Figure 2. Example of a mind map with chain of associations highlighted to illustrate semantic overlap with mind map in Figure 3.

Malloy CCCC87 Idea Integration

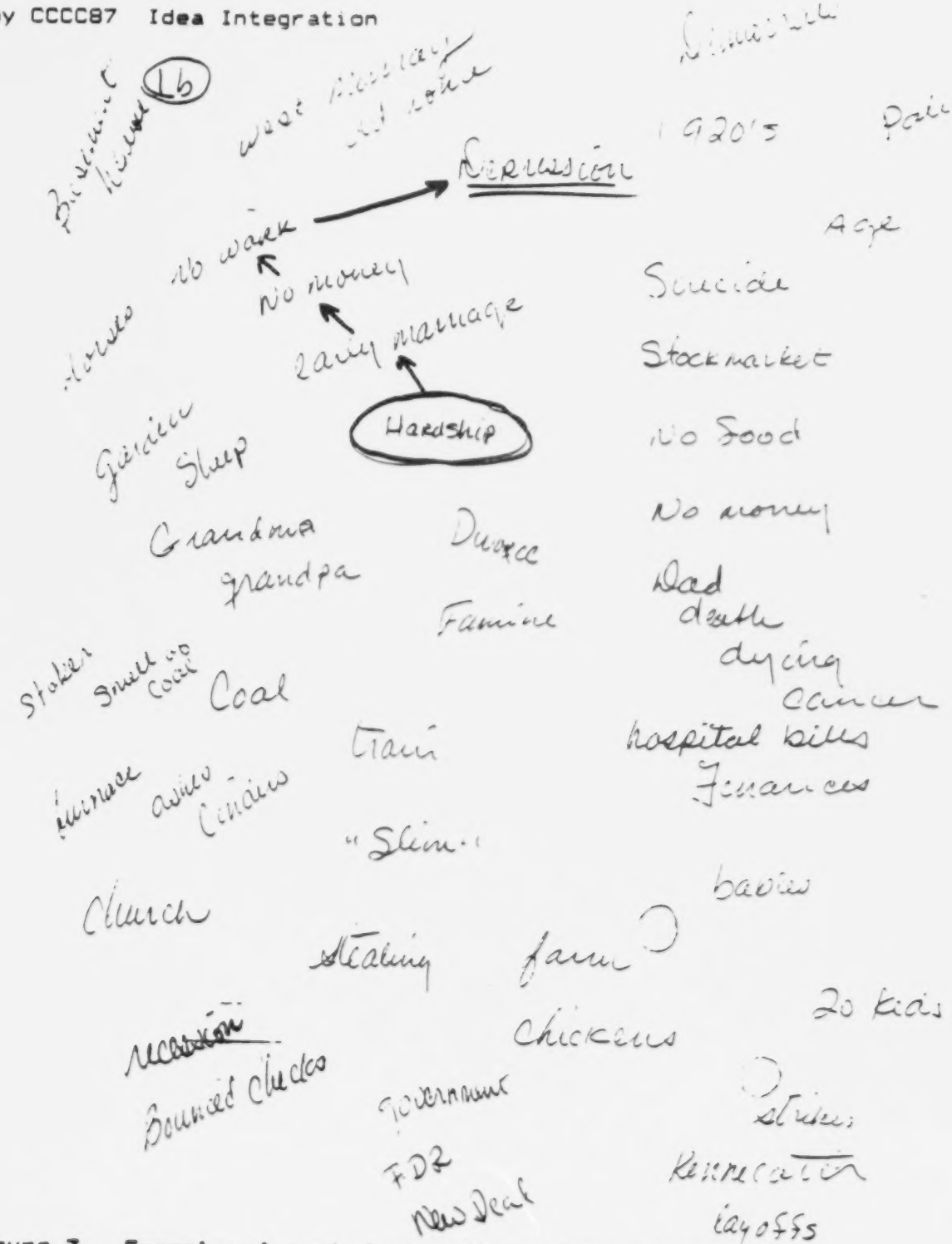

Figure 3. Example of a mind map with a chain of associations highlighted to illustrate semantic overlap with mind map in Figure 2.

Malloy CCCC87 Idea Integration

Reference experience for "Chunking"

[The information on this page should be on three separate pages. It is compressed here for purposes of presentation.]

PAGE 1:
Read over the list of words below. Them put them into categories or chunks based on meaning. That is, write short lists of words that go together based on what them mean. Make up a short name for each short list of words. Use as many chunks (short lists) as you wish to use.

president arms dollar treasurer eye chili-powder oil legs nickel mile mayor horseradish inch platinum mint head meter zinc lead senator penny dime foot governor chromium wine quarter yard

PAGE 2:
Now for this second list of words, do the same as you did with the first list, that is, break it into chunks based on meaning. Give each chunk a name.

workbench wrinkles pumpkin tongue villa chisel wind cave weeds karate apron voice stork malt rowboat yams spurs marigold virus cypress scallop quartz daughter booklet elk rose lace skillet

PAGE 3:

How were these word lists constructed?

STRUCTURED LIST:

These words were taken form categories listed in the Battig and Mantique norms. Depending on the categorey, I chose either frequent or infrequent words from the categorey.

Categories: Elective office (frequent words chosen)
Money (frequent words chosen)
Metals (infrequent words chosen)
Unit of distance (frequent words chosen)
Part of body (frequent words chosen)
Seasoning (frequent words chosen)

UNSTRUCTURED LIST:

These words were chosen from among infrequent responses to different categories. I had no prior categories in mind.

Malloy CCCC87 Idea Integration

Reference experience for Visual Integration

I will read you a list of five words. I want you to repeat the five words over and over in your head with your inner voice until I tell you to stop. Later I will ask you to remember the last four words when I say the first word.

PRACTICE LIST:

Ready: Pencil tree car house mountain

Now, the first word was "pencil," write down the other four words.

FIRST LIST:

Now for real. There will be five separate lists of five words each.

Ache	rhyme tonsil heat bandit
dawn	air guilt world portal
friction	throb music author exhaust
oxygen	dry squeal tower pipe
rhapsody	softness wail nutmeg retailer

That's all. Now I will read the key words and you write down all the words that you can remember that went with each key word.

Now I want you to do the same thing, but a little differently.

Give imagery instructions. [see for example, Bower, G. H. (1971). Mental imagery in associative learning. In L. W. Gregg (Ed.), Cognition in learning and memory. New York: Wiley, for a discussion of imagery instructions.]

PRACTICE LIST:

Ready, Ice tennis-racket soup lake truck
OK, the first word was ice, write down the other words.

Now for real. There will be five lists of five words each.

Avalanche	ticket oven spinach leopard
strawberry	world rattle athletics galaxy
Magazine	burn algebra amplifier hairpin
hospital	thorn moisture rough robin
caravan	utensil kiss breeze tickle

Have students grade all the lists for number correct. Then compare memory with repetition and imagery instructions. Make two points: Memory can change when you think differently; and images powerfully associate ideas.